



Materials Engineering Branch

TIP*



No. 049 A Method for Cleaning Packaging Materials

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In order to achieve optimum cleanliness of spacecraft flight hardware, especially when optical or critical thermal control surfaces are involved, it is of utmost importance to consider the type and cleanliness of packaging materials that are used to protect the hardware. A packaging material should never be considered clean unless it has been either cleaned or verified to be clean. In choosing a packaging material, one should select a material that has not been processed with additives. Therefore, plasticized materials should not be considered. The best types of packaging materials, from the cleanliness standpoint, are fluorocarbons (Teflon is one example), polyimides (such as Kapton) and metallic foils.

An important class of materials, in general use, is the electrical static discharge (ESD) films. As many experiments and components must be protected against ESD damage, they have found numerous applications. Within this class are the films that have their surface coated with an ESD agent and films that have a metal imbedded in the bulk material. The second type is much preferred as the metal (typically Ni or Al) is contained in the film whereas the ESD agent is often volatile and/or easily removed by solvent or contact forces. Examples of relatively clean metal filled polymer film products are Llumalloy and 3M's #2100 series of antistatic films

It should be remembered that nothing can be cleaner than the materials that are used to clean it. Cleaning cloths, swabs, cotton, etc. must be pre-washed or, preferably, Soxhlet extracted as no commercial product is usually sufficiently clean without some pretreatment, except possibly analytical grade filter paper. Containers for reagents and solvents must be made of materials that do not contaminate, such as glass, stainless steel or Teflon. Also, the cleaning fluids must be clean, such as ACS Reagent Grade or Spectroscopic Grade. Alcohol (isopropyl and ethyl) is a good all-around cleaning agent. Other cleaning fluids that have been used frequently are acetone and hexane. The residue after evaporation from such fluids should be less than 0.001% of the mass of the solvent collected.

Cleaning Procedure

1. Suspend the plastic packaging or metal filled film from a clothesline arrangement with non-contaminating clips such as stainless steel, Teflon or polyolefin.
2. Spray both sides of the film with reagent grade isopropyl alcohol from a Teflon or stainless steel spray container. Allow the film to drip dry.
3. Repeat step 2 and collect the washings in a clean container.
4. Evaporate the washings to dryness on a steam bath and determine the amount of residue. If the washings contain more than a trace of residue, repeat step 2 and 4 until the washings are residue-free (less than 0.001% of the mass of the solvent before evaporation).
5. When completely dry, roll up or fold the packaging film and protect it from contamination.

The above cleaning procedure should be performed in a clean area and may be modified to suit the circumstances. For example, the material may be raised and lowered in and out of a cleaning bath, or may be swab-cleaned with clean cloths. However, in any case, the cleanliness should be verified by determining the residue content of the final wash.